

# New ADEQ Rules Advance Water Recycling

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### Past, Present, Into the Future

#### Arizona in the national reuse context

#### Arizona reuse—past and present

#### **Current rule revision**

- Recycled water umbrella
- Gray water
- DPR
- Next steps





## Reclaimed Water Milestones

1972 - First reclaimed water rules, ADHS

2001 - Comprehensive rules transform program



Reclaimed water pipeline, City of Chandler



Viticulture with reclaimed water, Cottonwood (Yavapai College photo)



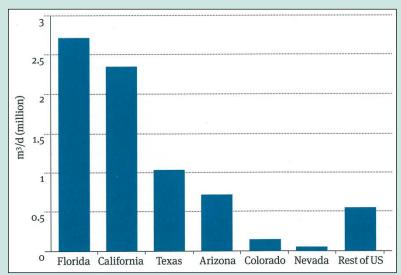
#### Rules Helped Spur Reuse, National Prominence

#### 82% of reuse occurs in just four states, Arizona being one



**Map: Western Water, July/August 2008** 

**Reused Wastewater Flows, 2014** 

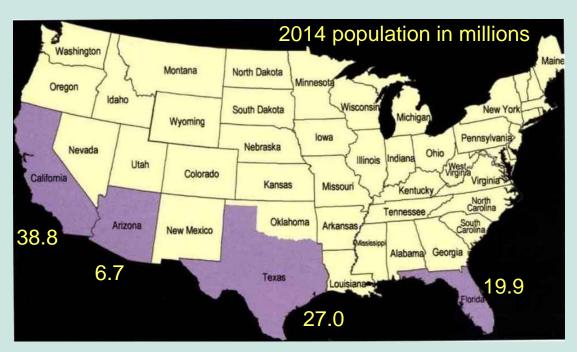


Source: Bluefield Research

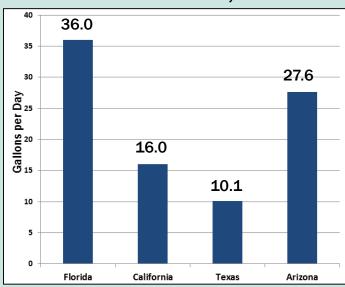


#### Rules Helped Spur Reuse, National Prominence

#### Arizona is 2nd highest nationally in per capita reuse



#### Reuse Per Person, 2014





#### Rules Helped Spur Reuse, National Prominence

Water Reuse Capacity (AF/yr)		Reclaimed Water as % of Total Water Supply		
Israel	510,000	20%		
Singapore	80,783	30%	*	
United States	3,400,000	3%		Source: Bluefield Research
Florida	955,000	4%		
California	807;000	2%		
Texas	482,000	3%		
Arizona	504,000	7%		$\leftarrow$

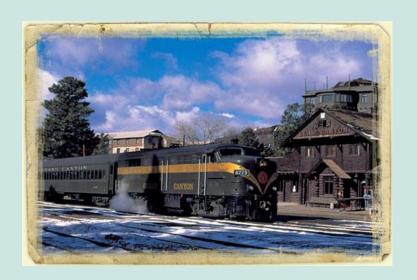
...but #1 at integrating reuse into the water supply portfolio



## Grand Canyon Village

# 1926 - First WWTP in US built specifically to allow reuse (0.13 mgd capacity)

- Toilet flushing
- Boiler feed for power generation
- Water for steam locomotives



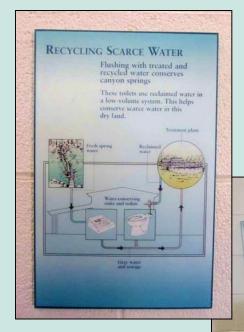




## Grand Canyon Village

# Still water-short today, still using reclaimed water!

- Toilet flushing
- Landscape irrigation



Restroom at Visitor Center, Grand Canyon National Park, 2013



### Early Reuse

# 1932 – irrigated agriculture receives reclaimed water from new Phoenix 23rd Avenue WWTP



- Phoenix WWTPs supply reclaimed water for irrigated agriculture to this day



#### Sewage Farming:

#### A Trip Back in Time

#### Irrigation with <u>raw</u> sewage

- Popular in arid west due to limited water supplies
- Reached peak in CA in 1923
  - over 70 cities had sewage farms for growing food crops
- AZ sewage farms in 1937
  - Phoenix
  - Tucson
  - Casa Grande
  - Nogales

Phoenix Sewage Farm (USGS, 1899)





# Ahead of the Times

### Jan 1972 – 1st reclaimed water rules



1974—Reclaimed water reuse begins at Fountain Hills

R9-20-01

HEALTH SERVICES

Title 9

ARTICLE 1. RESERVED

ARTICLE 2. RESERVED

ARTICLE 3. RESERVED

ARTICLE 4. RECLAIMED WASTES

Reserved

R9-20-400.

The regulations in this article are adopted pursuant to the authority granted by R9-20-401. Legal authority A.R.S. §§ 36-1854.3 and 36-1857.

Added Reg. 1-72.

The regulations in this article govern the direct reuse of reclaimed wastes, and all waste discharges into the waters of the State shall be in compliance with the "Water Quality Standards for Surface Waters in Arizona".

Added Reg. 1-72.

A. The direct reuse of wastes originally containing human or animal wastes is R9-20-403. Applicability prohibited unless such wastes comply with the standards in this article.

B. Nothing in this article shall be construed as an exemption from other applicable Rules and Regulations of the Arizona State Department of Health including but not limited to R9-8-249.

Added Reg. 1-72.

All wastes shall receive a minimum of secondary treatment or its equivalent R9-20-404. Secondary treatment

A. Irrigation of fibrous or forage crops not intended for human consumption. before they are used for any of the following purposes: B. Irrigation of orchard crops by methods which do not result in direct

application of water to fruit or foliage

C. Watering of farm animals other than producing dairy animals.

Added Reg. 1-72.

R9-20-405. Secondary treatment and disinfection A. All wastes shall receive a minimum of secondary treatment or its equivalent and disinfection before they are used for any of the following purposes:



## Reclaimed Water for Power Generation

# 1983 – Arizona's largest WWTP in Phoenix begins delivery to Palo Verde NGS

- Largest nuclear power plant in US
- Unique in world: 100%-cooled by reclaimed water



**Palo Verde Nuclear Generating Station** Photo: AMWUA



## Reclaimed Water for Power Generation

#### **Palo Verde Nuclear Generating Station**

- Receives 60 mgd
  - 45% of WWTP flow
- 36 mi. long pipeline
  - Up to 9½' in diameter
  - 3% of entire US reuse!



Lined impoundment for cooling tower brine, Palo Verde Nuclear Generating Station

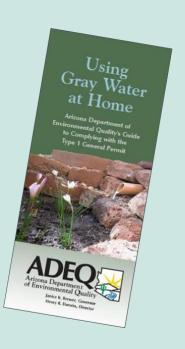


# 2001—Comprehensive Rules Transform Program

- Stringent treatment standards for new/expanded WWTPs under APP
- Permit program for reclaimed water end users
- RWQS for five classes of reclaimed water (A+, A, B+, B, C)
- List of end uses allowed for the five classes
- Home gray water use allowed without a "hard" permit





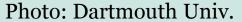




# Key 2001 Change—New WWTP Standards

# New and expanding WWTPs must employ Best Available Demonstrated Control Technology (BADCT)

- Pathogen-free effluent
  - No E. coli, 4 of 7 daily samples
  - Never over 15 cfu/100 ml
- Nitrogen removal, ≤10 mg/l
- Odor control





Stringent treatment standards -> clean water for reuse



## Some Class A+ and A Allowed Uses

- irrigation of food crops
- recreational impoundments
- residential/schoolyard irrigation
- toilet & urinal flushing
- fire protection systems
- snowmaking
- and more



**Arizona Snowbowl** 



Reclaimed Water Fire Hydrant



Landscape impoundment, Freestone Park, Gilbert, AZ



# In Arizona, Reuse is Ubiquitous!

#### ADEQ's 98 largest permitted WWTPs (> 1 mgd)

- 93% distribute reclaimed water for reuse/recharge
- 56% distribute Class A+ water

#### **100% reuse**



EPCOR Wishing Well WWTP, Ft Mohave, 1 mgd, Valentine Engineering photo

#### 100% reuse and recharge



City of Scottsdale
Water Campus, 20 mgd
Credit: Aerotech Mapping



# Arizona's Largest Reclaimed Water System

#### **City of Tucson**

Serves 1000s of residential, M & I, and agricultural users

160 miles of purple pipe

18 golf courses

50 parks

65 schools (incl. Univ. of Arizona)

>700 single family homes



Irrigating athletic field with reclaimed water, University of Arizona





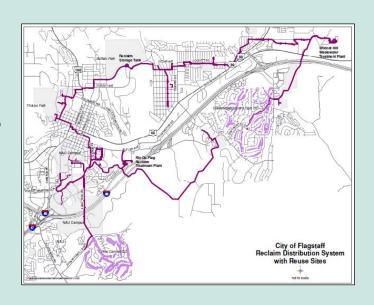
### Another Large System

#### City of Flagstaff

- 13 schools (incl. NAU)
- 18 parks & other landscaped sites
  - 4 golf courses
  - 2 cemeteries
  - 1 ski area
  - 1 industry: SCA Tissues









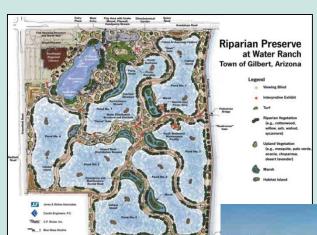


### Recharge is Impressive!

#### 56 reclaimed water recharge facilities permitted by ADWR

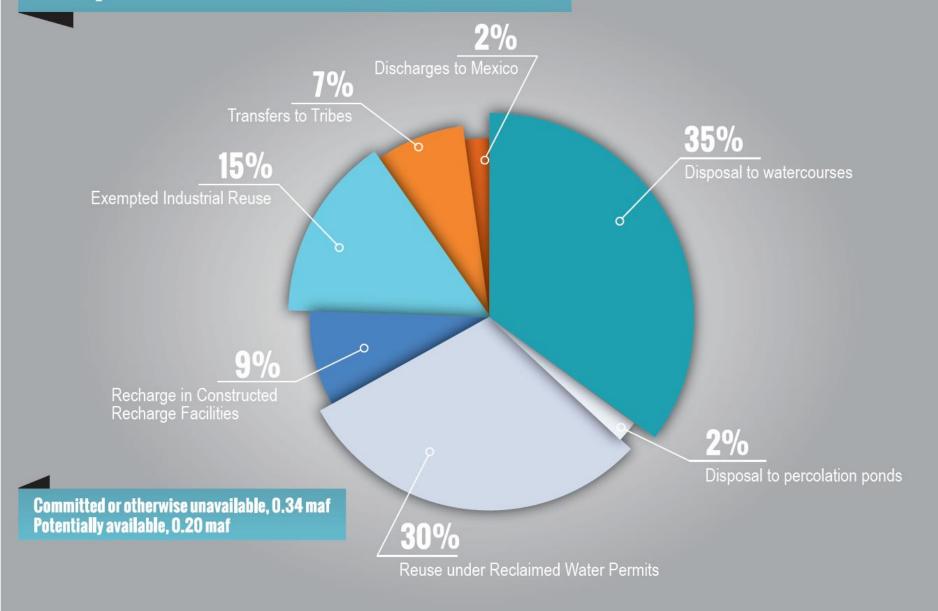
- Permitted capacity is 16% of permitted WWTP capacity
- 8.8% of total WWTP flows were recharged in 2014







#### **Disposition of Treated Wastewater**



#### Notes.

- 1. Percentages are tentative. Do not cite.
- 2. Chart does not include septic tanks, which serve 20% of Arizona's population.



### Discharges to Mexico



Yuma WWTP, AZ, discharges to Colorado R.

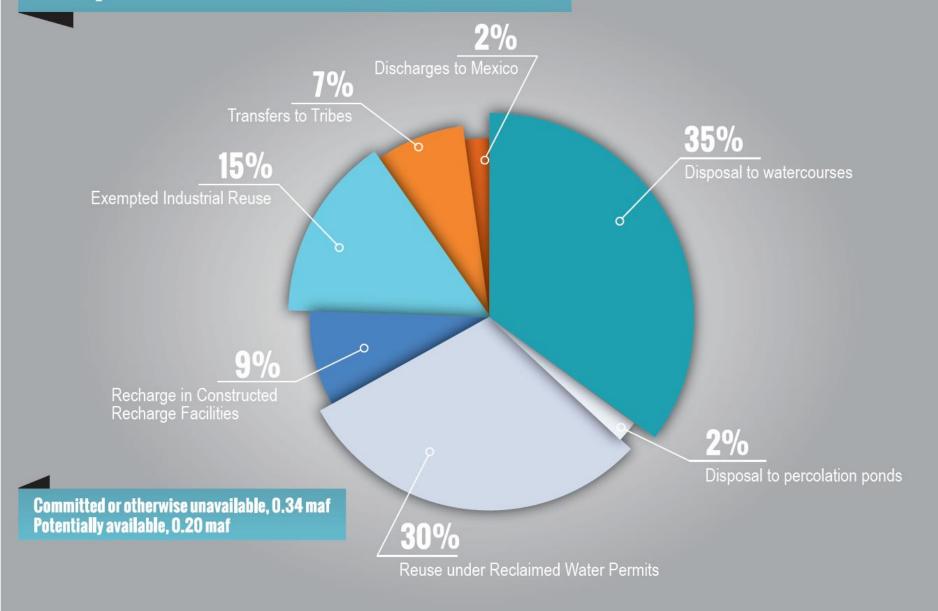
**Diverted by Morelos Dam for irrigation in Mexico** 





Douglas WWTP, AZ, outfall under border fence into Mexico for irrigation reuse

#### **Disposition of Treated Wastewater**



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# Unintended Consequences?

# Is reclaimed water becoming so valuable that riparian areas dependent on it are becoming threatened?



Santa Cruz River below Nogales International WWTP, an "effluent dependent" stream

Photo: Channing Turner, Cronkite News



# Why The Current Rule Revision?

- Keep up with the rapidly advancing reclaimed/reuse field
- Even more need for sustainable water supplies
- Need to review 2001 reclaimed water quality standards
- Need to address potable reuse



Advanced treatment of reclaimed water, Scottsdale Water Campus

City of Scottsdale photo

### New Rule Effective Jan 1, 2018



# Recycled Water

Reclaimed Water Gray Water

Recycled Industrial Wastewater Potable Reuse

## New Recycled Water Umbrella





Article 7	Use of Recycled Water		
Part A	General Provisions		
Part B	Reclaimed Water		
Part C	Recycled Industrial Wastewater		
Part D	Gray Water		
Part E	Purified Water for Potable Use		





## "Recycled Water" means...

"a processed water that originated as a waste or discarded water, including reclaimed water and gray water, for which the Department has designated water quality specifications to allow the water to be used as a supply."





### **Key Changes**

- 1. New "recycled water" nomenclature
- 2. Umbrella for adding other recycled waters in future
- 2. Improved administrative requirements for permits
- 3. Better larger-scale gray water permit
- 4. New permit and interim criteria for direct potable reuse



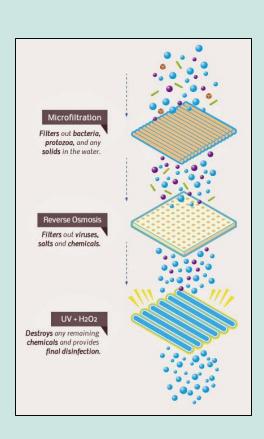


## New Part E Allows DPR

# Creates Recycled Water Permit for Purified Water for Potable Use

 Permit is for an Advanced Reclaimed Water Treatment Facility

"a facility that treats and purifies Class A+ or Class B+ reclaimed water to produce potable water suitable for distribution for human consumption."





## DPR Under the New Rule

#### Produced water from an ARWTF

- no longer reclaimed water
- considered a surface water for purposes of SDWA
- all SDWA requirements apply
- rule is consistent with earlier Substantive Policy published by ADEQ that allowed permitting of Brew Challenge Trailer







# Design Report for an ARWTF Must Address:

- Source water characterization
- Pilot treatment system
- Microbial control technology
- Microbial logarithmic reduction targets
- Chemical control technology
- Monitoring plan
- Start-up plan
- Operation and maintenance plan
- Operator Training
- Technical, financial, and management capability



# Toast 2018 New Year's Eve with a 'toilet to tap' brew!



#### By end of 2017, 'toilet to tap' water could be legal in Arizona, officials say

for drinking could be legal without ill effects, Graf and ter in 1982. in Arizona by the end of this other officials said.

months, its senior hydrol- ADEQ, which wants the mittee this week in Phoenix.

week. Better technology and decision.

"direct potable reuse" in six said in an interview. The a state water recycling com-

ogist Chuck Graf said this change, will make the final

Once mocked as "toilet safety measures now offer Direct reuse has been illeto tap," the practice of di- assurances the wastewater gal in Arizona since the state Later has become sooner," rectly treating wastewater can be treated for drinking started regulating wastewa- he said.

The first of a series of per- come. It's a large theme tak- pushing for more liberal pol-The Arizona Department mitting rules and standards ing place across the U.S. and of Environmental Quality is "hopefully can be approved the world," Tucson Water ter for drinking, such treatlikely to propose legalizing by the end of this year," Graf director Tim Thomure told ed water isn't likely to be

that this would be needed sooner rather than later.

But while water utility of-"Water reuse's time has ficials around the state are icies for treating wastewa-

#### President orders wall to be built along border

Trump also moves to cut grants to any city that protects migrants







And the winner is... **Dragoon Brewing Company** 

Clear Water Pilsner





# What Next? More Rulemaking

- Expert work groups formed in April, 2017, to provide recommendations to ADEQ
  - Reclaimed WQ standards, Dr. Channah Rock, Chair
    - review standards based on current science
  - Infrastructure/technology, Tim Thomure, Chair
    - detailed criteria for potable reuse



Wheeling reclaimed water around, Gilbert Riparian Preserve

Town of Payson Green Valley Lake





### Next Rulemaking Installment

 Convene work group to determine feasibility of allowing reuse from on-site wastewater treatment systems





**Aerobic On-site Wastewater Treatment System** 



# Stay tuned for next steps

Find us at: www.azdeq.gov

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